

filled with chopped tow, and the skull should be afterwards "thinly plastered over with soft clay." "The hollow bags of the wings" should also be filled with cut tow and the leg-bones wrapped with the same material. A false body of tow and wire should now be made, and when, after a complicated process, this has been introduced into the skin, the latter should be placed in a trough, or a paper band or strip may be used, a plan which is considered superior to wrapping in cotton. Of mammal skins, by the way, Mr. Browne has apparently never heard, for we do not find them mentioned in his work.

In mounting birds from skins no mention is made of the most important part of the whole process, that of scraping and separating the shafts of the feathers from the inside whereby the plumage regains much of its former fluffiness. For the rest the author mounts his birds much as do other taxidermists.

The chapters on casting and modelling reptiles, amphibians, and fishes, and on the reproduction of certain invertebrates, contain information which has not previously appeared in works on taxidermy, though the methods given are in use in similar or improved form by our leading taxidermists and modellers.

Chapter IX, on casting and modelling from natural foliage, flowers, etc., is largely based on the methods of Mr. J. H. Mintorn and Mrs. E. S. Mogridge, whose work is so well and so favorably known in this country. As such it will be welcomed by all taxidermists who appreciate the value of a proper setting for their work.

The excellence of this chapter gives us reason to regret that Mr. Browne did not avail himself of the discoveries of his fellow workers in other branches of his art, for while his book may stand as a complete exposition of his own methods and ideas, it can by no means be considered as an adequate treatise on artistic and scientific taxidermy.—F. M. C.

Witchell's 'Evolution of Bird-Song.'¹—Says the author: "However novel or otherwise may be the theories stated in this book, I can at least claim that, so far as I am concerned, they are absolutely original, all of them having been committed to writing, though in some instances, not under their present titles, before I consulted any person, or any book, in regard to them." The subject is treated in ten chapters, under the following headings: The origin of the voice; alarm-notes; the influence of combat; the call-note; the simplest songs; noticeable incidents connected with bird-song; the influence of heredity in the perpetuation of the cries of birds; variation in bird-voices, its cause and effects; the influence of imitation in relation to bird-song. An appendix gives 'Tran-

¹ The | Evolution of Bird-Song | with | Observations on the Influence of Mimicry and Imitation | By | Charles A. Witchell | Author of the Fauna of Gloucestershire | London | Adam and Charles Black | 1896 [New York : Macmillan & Co. Price. \$1.75.] 8vo, pp. x, 253.

scripts of music sung by Blackbirds, Thrushes, and Skylarks,' and a bibliography.

The 'evolution of bird-song' is a subject that easily lends itself to speculation; while there is ample basis of fact for the discussion of many phases of the subject, in some respects the field is open for the free use of the imagination. Our author in the main has held himself in good restraint, but of course many of his suggestions are necessarily founded on conjecture.

After recounting some of the facts regarding the vocal and other sounds emitted by nearly voiceless animals, such as newts, young frogs, serpents and tortoises, and Darwin's theory that voice originated in the involuntary contraction of muscles, through the excitement of fear or anger, he reaches the conclusion that we may consider "the voice to have been evolved from a toneless puffing, indicative of anger, or from snorts or grunts accidentally caused."

Alarm-notes are produced by the anticipation of danger, while further development of the voice is due to the influence of combat, developing notes of defiance or triumph. "The first call-notes of birds were probably mere adaptations of alarm-cries"; the simpler songs of many species were at first mere repetitions of call-notes. Proof of heredity is found in the family resemblances between the notes of allied birds, as the call-notes and songs of thrushes, etc., at points geographically widely separated. "It is probable that, speaking generally, the cries of birds which have limited voices are inherited, and that those of what are commonly called 'singing-birds' are perpetuated through the agency of mimicry"—not only of other birds' notes but of sounds produced by the elements, as "the moaning of the wind in hollow trees," "the murmurs and gurgles of rippling streams," and the sounds made by insects and quadrupeds. These are, in brief, the principal conclusions presented by the author of 'Evolution of Bird-Song.'

Mr. Wittchell is beyond question a keen observer of birds in life, and has given a large amount of time to the subject he here attempts to elucidate. The book is well written, and abounds in interesting and suggestive facts derived from the close study of birds in their natural haunts. Here and there, however, a speculative remark or suggestion might well have been omitted, as either too far-fetched or superfluous to his subject. The 'bibliography of the subject', is quite too general and incomplete to be satisfactory, and we miss from it a number of titles one would naturally expect to find in such a list. A reference like the following, for example—"Zoologist, The. A monthly publication, London"—is hardly the kind of bibliography one will be likely to commend who is in search of special papers relating to the 'Evolution of Bird-song.' He appears to have quite overlooked Mr. Samuel N. Rhoads's paper, entitled 'The Mimetic Origin and Development of Bird Language' (*Am. Nat.* XXIII, March, 1889, pp. 91-103), where he will find his theories and many of his conclusions anticipated by Mr. Rhoads.—J. A. A.